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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	:	
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Gunter BAUER	:	
	:	
Serial No.: To be assigned.	:	Group Art Unit:
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Filed: April 11, 2001	:	Corresponding to: DE 100 18 020.5-34
	:	Filed April 11, 2000

For: **Electrical Connection Arrangement And Method for the Manufacture Thereof"**

McLean, Virginia

CLAIM FOR BENEFIT OF FILING DATE OF PRIOR FOREIGN APPLICATION

Honorable Commissioner of Patents and Trademarks
Washington, DC 20231

Sir:.

In the matter of the above-identified application, a claim is hereby made under the provisions of 35 U.S.C. §119 for the benefit of the filing date of the corresponding German application No. DE 100 18 020.5-34 filed April 11, 2000, which is referred to in the Declaration of the present case.

A certified copy of said German application will be forwarded as soon as it is available.

Respectfully submitted,

Miles & Stockbridge P.C.

Date April 11, 2001

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Electric Circuit Arrangement and Method for Manufacturing it

Description

The invention refers to an electric circuit arrangement, in particular for closing devices in automotive vehicles, comprising a track formation, the track formation having at least one connection portion, the connection portion being electrically conductively connected to a connection zone of an electrical component. Furthermore, the invention refers to a method for manufacturing the electric circuit arrangement.

Nowadays, electric circuit arrangements of the type referred to here are applied in many electric devices. Depending on the device which they are provided for, those electric circuit arrangements have to fulfill different requirements as for their functional reliability and operational stability. It is logical that the requirements concerning functional reliability and operational stability of the circuit arrangements are lower for fixedly installed and indoor operated devices than for mobile and outdoor operated devices. Among other things, those requirements are particularly high for devices which are installed in automotive vehicles, as for example closing devices for car side doors, car rear flaps, car engine hoods or the like, because here, the circuit arrangements are frequently strongly stressed by occasionally occurring extreme outside temperatures and air humidity, by strong variations of those quantities, by soil particles in the ambient air as well as by mechanic vibrations.

Therefore, it is an object of the invention to provide an electric circuit arrangement which is to a high degree functionally reliable and operationally stable even if it is strongly stressed. Furthermore, it is an object of the invention to develop a method for manufacturing such an electric circuit arrangement.

According to the invention, the object is achieved by a circuit arrangement of the type referred to here in which a wall is arranged in the vicinity of the connection portion and the connection zone such that a tub is formed in which a moulding mass is distributed. The

connection portion and the connection zone which are electrically connected to each other by a soldered joint or a weld joint are protected from their surroundings by the moulding mass which covers the connection portion and the connection zone. Soil particles in the ambient air are kept away from the soldered or weld joint, in case of a soldered joint in particular from its especially sensitive soldering tin. Furthermore, the moulding mass reduces the influence of extreme outside temperatures and air humidity as well as the influence of large variations of those quantities so that the connection portion and the connection zone are stressed less. The application of the moulding mass, that is a mass which is applied in pasty form and cures subsequently, shows the advantage that an optimal adaption to the spatial form of the connection portion and the connection zone is enabled, resulting in an optimal coverage and thus protection. One further advantage becomes obvious in case during its application to the connection portion and the connection zone, the moulding mass is that liquid that it deliquesces, which means that it disperses beyond the connection portion and the connection zone. The wall of the tub limits this dispersion. Thus, a deterioration of other components of the track formation is avoided.

In a preferred embodiment, it is provided that within the tub, the track formation is provided with at least one additional electric component. The additional electric component is completely covered by the moulding mass. Therefore, it is particularly well protected from external influences. Consequently, the arrangement of the additional component is especially suitable for highly sensitive additional electric components.

In a further embodiment, it is provided that the track formation is flexible. Because of this – plastic or elastic – flexibility, it is especially simple to adapt the track formation to the spatial form of the device.

Furthermore, it is preferred that the track formation has a bent portion within the tub. Thus, the area of the track formation which is within the tub and which is covered by the moulding mass can be enlarged in a simple way, which enables the arrangement of more than one additional electric component within the tub.

It is provided in a further preferred embodiment of the invention that the circuit arrangement is arranged within a housing. The housing provides a simple additional means for protecting the circuit arrangement from external influences.

In yet a further preferred embodiment of the invention, it is provided that the wall forms part of the housing. Advantageously, no separate means for keeping the wall in its spatial position have to be provided. In this embodiment, the tub forms part of the housing.

It is provided in a further embodiment of the invention that the housing has at least one holding protrusion, the holding protrusion extending through a holding opening of the track formation. This embodiment shows two advantages. On the one hand, assembling the track formation within the housing becomes easier. The track formation must only be arranged within the housing such that the holding protrusion extends through the holding opening. On the other hand, the track formation of this embodiment is securely kept in its position when the device works, in particular if vibrations are present. It can be provided that the holding protrusion has a head manufactured by applying a stamp to the preheated or not preheated holding protrusion, the head being larger than the holding opening, whereby the track formation is securely kept within the housing.

Furthermore, it is preferred if the housing has at least one receiving portion which receives a holding zone of the component. This embodiment enables that the component is securely kept in its position.

Finally, it is preferred if the track formation comprises a plurality of layers and/or at least one layer of the track formation includes the tracks and/or at least one of the layers is an isolating layer. In this embodiment, the track formation is a multilayer track formation. In case the isolating layer is in direct contact with the moulding mass, the layer of the track formation including the tracks is especially protected. Thus, a deterioration of the tracks, especially when distributing the moulding mass in the tub, can be avoided easily.

Furthermore, the object is achieved by a method for manufacturing an electric circuit arrangement, in particular according to one of the claims 1 to 11, the method being

characterized by the following steps: (a) generating the electric connection between the track formation and the electric component, (b) arranging the track formation within the housing and (c) distributing the moulding mass in the tub.

Further embodiments of the invention along with their advantages result from the drawing.

In the following, the invention is explained in more detail taking referrence to a drawing. In the drawing

Figure 1 shows a schematic top view of an electric circuit arrangement according to the invention,

Figure 2 shows a cut (cutting plane A) through the circuit arrangement according to Figure 1 and

Figure 3 shows two further cuts (cutting planes B and C) through the circuit arrangement according to Figure 1.

Figure 1 shows an electric circuit arrangement 1, as it is for example applied in closing devices for side doors, rear flaps, engine hoods or the like of automotive vehicles.

The circuit arrangement 1 comprises a track formation 2. In Figure 1, two portions 2a and 2b of the track formation 2 are shown. The track formation 2 is a flexible, foil-like track formation 2 including several layers 3. The layers 3 of the track formation 2 are isolating layers and track including layers. The isolating layer includes openings so that the tracks of the track including layer can be accessed from outside. Within the openings, the tracks run into connection portions 5 formed as soldering pads 4. At the connection portions 5, an electric connection with connection zones 6 (not shown in Figure 1) of an electric component 7 is realized.

The electric components 7 of the track formation 2 are a switch 7a and a connector 7b. The connection between the connection portions 5 of the track formation 2 and the connection zones 6 of the electric component 7 is a soldering joint.

The circuit arrangement 1 is arranged within a housing 11 (not shown in Figure 1). In Figure 1, walls 8 of the housing 11 are visible. In the vicinity of the connection portions 5 and the connection zones 6, the walls 8 are arranged such that they form along with the electric components 7 tubs 9, each tub 9 being open on one side. The tubs 9 contain a moulding mass 10, the moulding mass filling the tub 9 completely. Within the tubs 9, the moulding mass 10 covers the connection portions 5, the connection zones 6 as well as parts of the isolating layer of the track formation 2.

Figure 2 shows a cut through the circuit arrangement 1, the cut being made with respect to a cutting plane A. This figure shows the plastic housing 11, a part of which forms the wall 8 of the tub 9.

Furthermore, this figure shows that the track formation 2 is not part of a plain. In a first zone 12a, the track formation 2 extends along the surface of the housing 11 and in a second zone 12b, the track formation 2 extends along the outer surface of a holding protrusion 17, the holding protrusion 17 being formed in the housing 11. In a third zone 12c, the track formation 2 extends – approximately parallel to its direction of extension in zone 12a – through the lower portion of the tub 9. Next to the zone 12c, the track formation 2 has a bent portion 13 in a zone 12d. The track formation 2 ends in the connection portion 5. It is obvious that as a consequence of its flexibility, the track formation 2 can adapt to any spatial form determined by the housing 11 or the electric component 7.

In the third zone 12c, the track formation 2 is provided with an additional electric component 14. The additional electric component 14 is a surface-mounted resistor. Other components, in particular wired components, can likewise be applied as additional electric component 14.

Figure 2 shows that the tub 9 is formed by the wall 8, the housing 11 and the component 7. The connection zone 6 of the electric component 7 extends away from the component 7 into the interior of the tub 9 where it is electrically connected to the connection portion 5 of the track formation 2 by means of a soldering joint.

The interior of the tub 9 is completely filled with the moulding mass 10. As a consequence, the additional electric component 14, the bent portion 13 of the track formation 2, the connection portion 5 of the track formation 2 and the connection zone 6 of the component 7 are completely filled or encapsulated, respectively, by the moulding mass 10. Epoxide resin is used as moulding mass 10, wherein the epoxide resin is brought into the tub 9 in gel-like or pasty form and cures within the tub 9 subsequently.

Figure 2 clearly shows in which way the component 7 is fixed within the housing 11. For this purpose, it comprises two holding zones 14 extending away from the body of the component 7 and engaging in receiving portions 16, the receiving portions 16 forming part of the housing 11. This arrangement ensures that the component 7 is securely held by the housing 11.

Figure 3 comprises 2 subfigures, each subfigure showing one further cut through the circuit arrangement 1. The circuit arrangement 1 comprises several holding protrusions 17, the holding protrusions being formed in the housing 11. The holding protrusions extend through holding openings 18 of the track formation 2 and end in heads 17a – the heads being generated by applying a stamp to the preheated or not preheated holding protrusions and the heads being larger than the holding openings 18 so that the track formation 2 is securely kept by the housing 11. On the one hand, the assembly comprising the holding protrusions 17 and the holding openings 18 facilitates the mounting of the track formation 2 in the housing 11; on the other hand, it ensures that the track formation 2 is securely kept in the housing 11.

The right subfigure of figure 3 shows that the track formation 2 within the tub 9 can additionally be provided with several additional components 14, provided that the dimensions of the tub 9 are chosen suitably.

Patent claims

1. Electric circuit arrangement, in particular for closing devices in automotive vehicles, comprising a track formation, the track formation comprising at least one connection portion, the connection portion being electrically connected to a connection zone of an electric component, **characterized in** that in the vicinity of the connection portion (5) and the connection zone (6), a wall (8) is arranged such that a tub (9) is formed in which a moulding mass (10) is distributed.

2. Electric circuit arrangement according to one of the preceding claims, **characterized in** that the track formation (2) is provided with at least one additional electric component (14) within the tub (9).

3. Electric circuit arrangement according to one of the preceding claims, **characterized in** that the track formation (2) is flexible.

4. Electric circuit arrangement according to one of the preceding claims, **characterized in** that within the tub (9), the track formation (2) has a bent portion (13).

5. Electric circuit arrangement according to one of the preceding claims, **characterized in** that the circuit arrangement (1) is arranged within a housing (11).

6. Electric circuit arrangement according to one of the preceding claims, **characterized in** that the wall (8) forms part of the housing (11).

7. Electric circuit arrangement according to one of the preceding claims, **characterized in** that the housing (11) has at least one holding protrusion (17), the holding protrusion (17) extending through a holding opening (18) of the track formation (2).

8. Electric circuit arrangement according to one of the preceding claims, **characterized in** that the housing (11) has at least one receiving portion (16), the receiving portion (16) receiving a holding zone (15) of the component (7).

9. Electric circuit arrangement according to one of the preceding claims, **characterized in** that the track formation (2) comprises several layers (3).

10. Electric circuit arrangement according to one of the preceding claims, **characterized in** that at least one layer (3) of the track formation (2) has tracks.

11. Electric circuit arrangement according to one of the preceding claims, **characterized in** that one of the layers (3) is an isolating layer.

12. Method for manufacturing an electric circuit arrangement, the latter in particular according to one of the claims 1 to 11, **characterized by** the following steps: (a) generating an electric connection between the track formation (2) and the component (7), (b) arranging the track formation (2) in the housing (11) and (c) filling the tub (9) with the moulding mass (10).

Abstract

The invention refers to an electric circuit arrangement (1), the circuit arrangement (1) having a track formation (2), the track formation (2) having at least one connection portion (5), the connection portion (5) being electrically connected to a connection zone (6) of an electric component (7). The circuit arrangement (1) is characterized in that a wall (8) in the vicinity of the connection portion (5) and the connection zone (6) is arranged in a way that a tub (9) is formed in which a moulding mass (10) is distributed. Thereby, the connection portion (5) and the connection zone (6) are protected from outside influences such as humidity and temperature.

Munich, 20 April 2001

Designated and sworn in by the President of the District Court Munich II as translator for the English language, I hereby certify:

I have translated to my best knowledge the original of the German document into the English language. The translation is correct and complete.

Isabella Jellissen
Translator for the English language